

IVUS-Guided Recanalization for Central Vein Occlusion in Hemodialysis Patients: Two Case Report

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COI Disclosure

Speaker name :

Tomoyasu Sato

I have the following potential conflicts of interest to report:

- ☐ Consulting
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)
- ☒ I do not have any potential conflict of interest

Introduction of Central vein obstruction(CVO):

CVO is a serious complication for hemodialysis patients.

Cause:

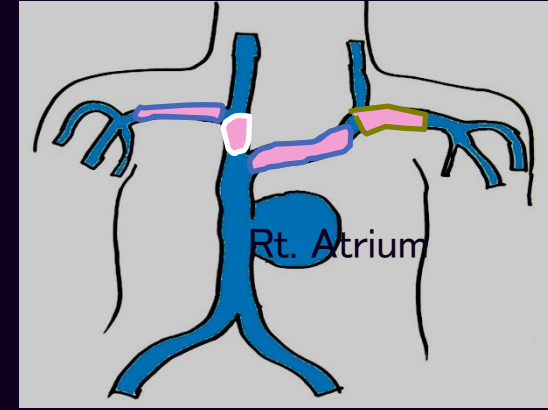
Benign:

- Shearing stress to the venous wall due to high volume and high pressure flow.
- Thrombotic event related
(CV catheter, Pacemaker lead)
- Extrinsic compression
(Aorta, Clavicle)

Malignancy: Lung, ML, LNs meta.

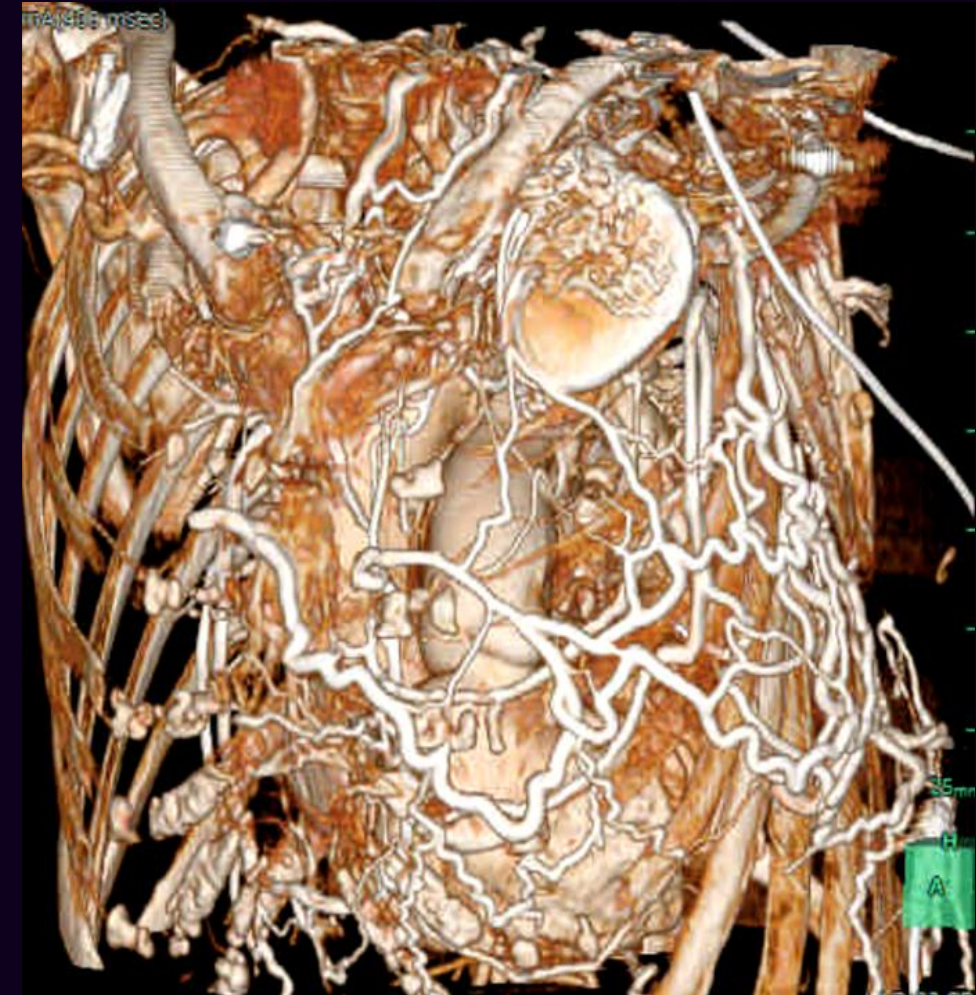
Incidence: 4.3 – 41 % of hemodialysis patients.

Symptom: Upper arm swelling, Dilated surface veins,
Venous hypertension, decreased dialysis efficiency



Symptom:

Edema of Entire arm due to venous hypertension



Treatment strategy for CVO:

Follow up

Shunt ligation

Bypass surgery

Endovascular recanalization

Bypass surgery for CVO



Journal of Vascular Surgery

Volume 29, Issue 3, March 1999, Pages 472–478



81971||

Right atrial bypass grafting for central venous obstruction associated with dialysis access: Another treatment option ☆☆☆

Rafik A. El-Sabrou, MD, FRCS, J. Michael Duncan, MD

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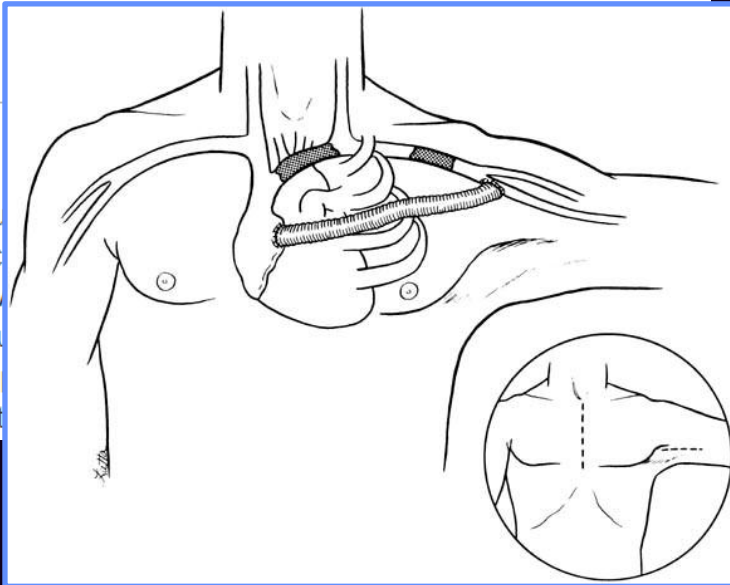
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Abstract

Purpose: Central venous obstruction (CVO) is a common complication in patients with dialysis access. Failure of the access leads to dialysis failure. We report our experience with right atrial bypass grafting in nine cases of central venous hypertension. To better understand the roles of surgery and placement. **Methods:** All patient



Journal of Vascular Surgery

Volume 40, Issue 4, October 2004, Pages 640–643



Axillary to saphenous vein bypass for treatment of central venous obstruction in patients receiving dialysis

Nikos Kavallieratos, MD^a, , Antonios Kokkinos, MD^a, Petros Kalocheritis, MD^b

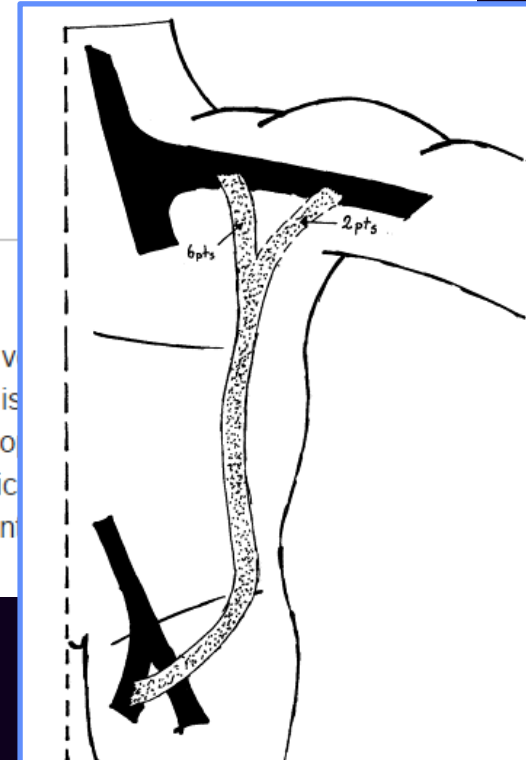
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doi:10.1016/j.jvs.2004.07.009

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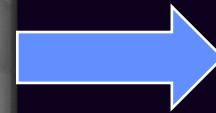
Objective

Venous hypertension due to subclavian or innominate vein obstruction is a common complication in patients with dialysis access. Therapeutic solutions must allow use of the angioaccess, and carry minimal surgical morbidity. We evaluated a simple surgical option, bypassing central venous obstruction with a great saphenous vein.

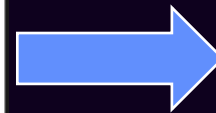
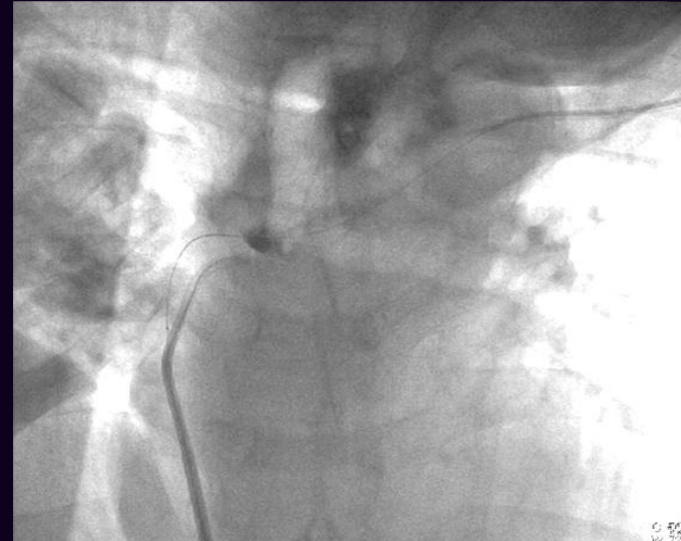


Basic endovascular recanalization for CVO:

Single directional



Bi-directional



Some cases are difficult to recanalize by these conventional method.

Sharp recanalization for CVO:

High-risk of complication

Percutaneous needle puncture.

Use of a Puncture Needle for Recanalization of an Occluded Right Subclavian Vein

Himanshu Gupta, Timothy P. Murphy, Gregory M. Soares

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Abstract

We report a patient in whom we used a puncture needle to initiate percutaneous recanalization of a chronic occlusion of the junction between the right subclavian vein and the right brachiocephalic vein. Under fluoroscopic guidance, an 18-gauge needle was used to puncture the right subclavian vein. When contrast material injected through the needle confirmed intravascular location, the needle was advanced until it deflected and perforated an occlusion balloon target positioned within the right brachiocephalic vein. This technique may be useful in patients with central venous occlusions that are refractory to traversal using traditional catheter and guidewire techniques.

Key Words: Veins, subclavian—Stenosis or obstruction—Stents and prostheses—Interventional procedures—Transluminal angioplasty

With an estimated 160,000 individuals in the United States requiring hemodialysis, maintaining well-functioning vascular access is

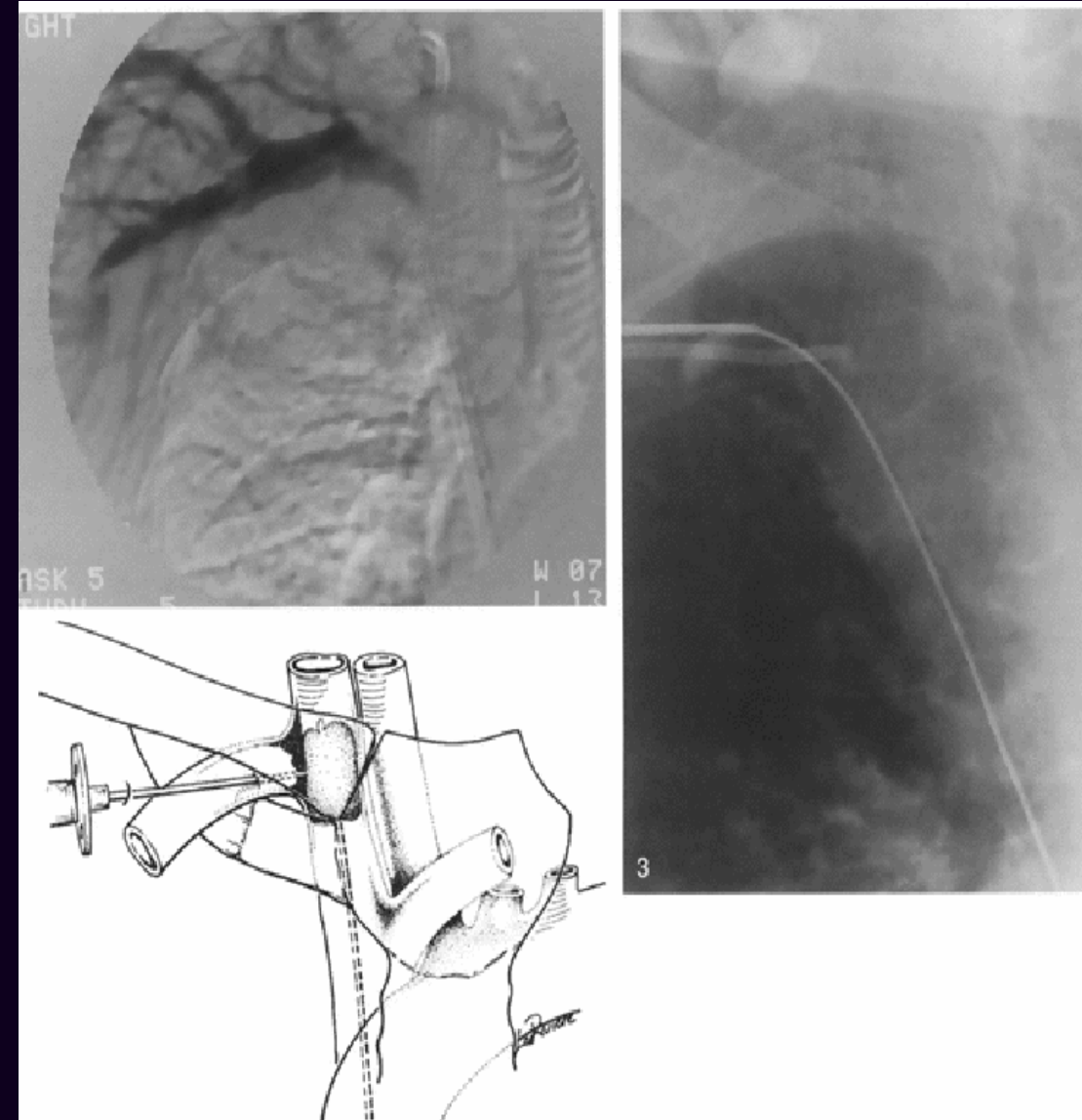
Correspondence to: T.P. Murphy, M.D.

of paramount importance [1]. Although indwelling central venous access catheters can provide temporary access, long-term access via surgically placed arteriovenous fistulas or shunt-grafts is preferred whenever possible [2]. Unfortunately, the incidence of catheter-related subclavian vein stenosis has been reported to be as high as 40% [3]. These lesions can remain asymptomatic until a hemodialysis fistula is created in the ipsilateral extremity, which results in edema, pain, and increased recirculation.

Though a stenotic subclavian vein can be readily traversed, permitting angioplasty and/or stent placement, chronically occluded subclavian veins are often refractory to traversal by guidewires and catheters. An untreated, chronically occluded subclavian vein makes the extremity unsuitable for hemodialysis access. We describe a novel technique for traversing a chronically occluded right subclavian vein.

Case Report

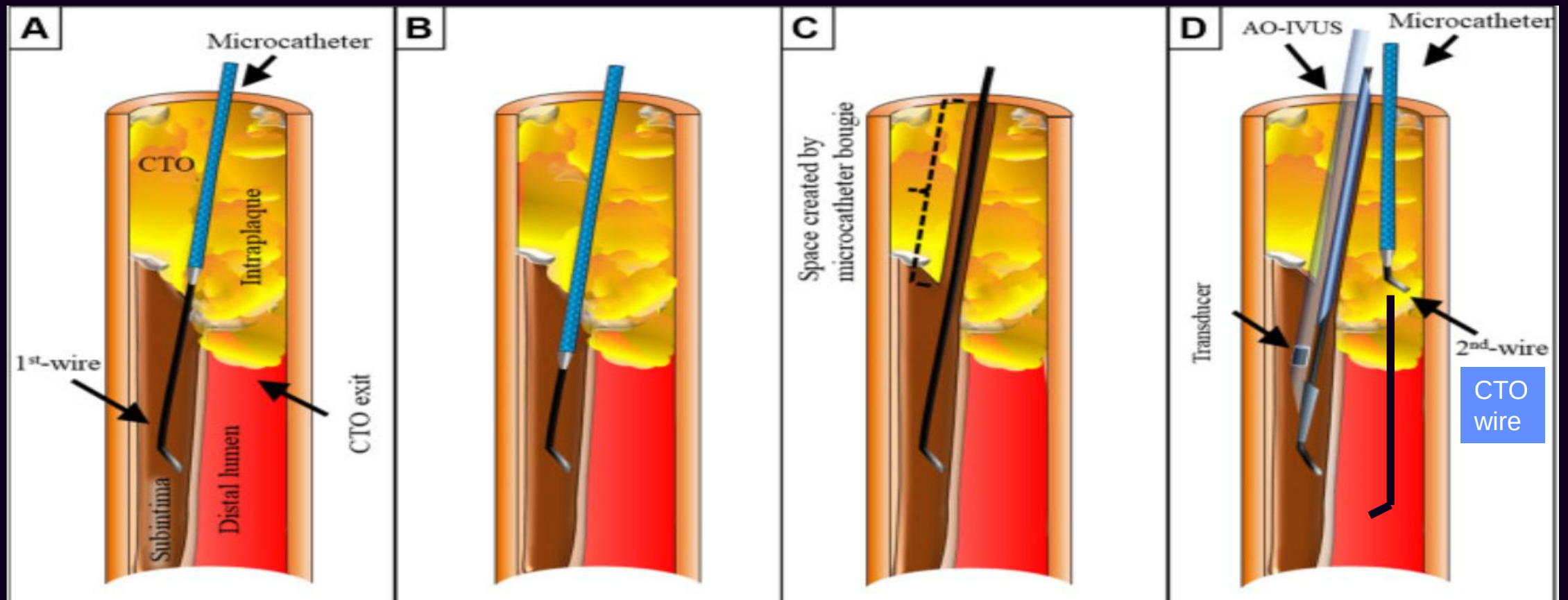
A 79-year-old woman with end-stage renal failure, being temporarily dialyzed via a right internal jugular vein dual-lumen catheter, presented with progressively worsening right arm pain and swelling after placement of a right forearm Cortex arteriovenous shunt-graft. Venography performed 1



We attempted IVUS guided recanalization for tough cases.

IVUS guided wiring is getting popular in the field of coronary CTO recanalization

Procedural Flow of IVUS-Guided Wiring (A to D).



Case1: 69 yo male

Past illness: HT, DL, DM

2009 : peritoneal dialysis

2010- : hemodialysis

Frequent PCI 2008- : 8times

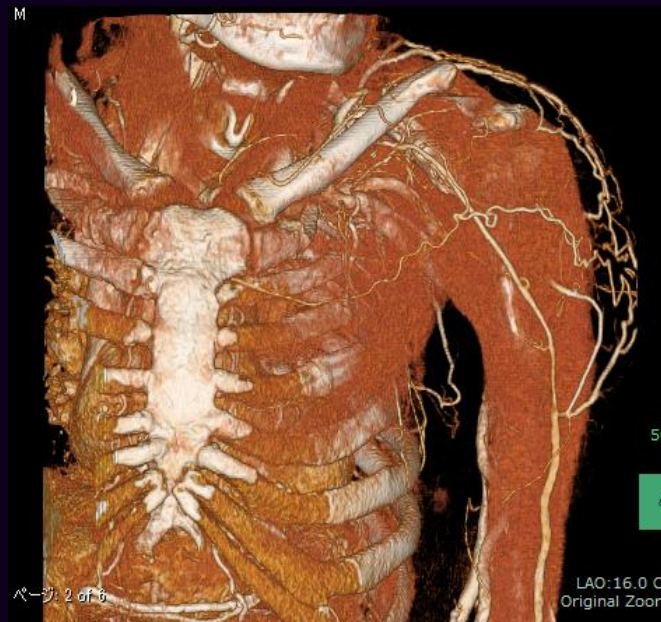
Frequent EVT 2015- : Rt 2times,

Lt 4 times and Distal bypass ---- AK amputation.

Present illness:

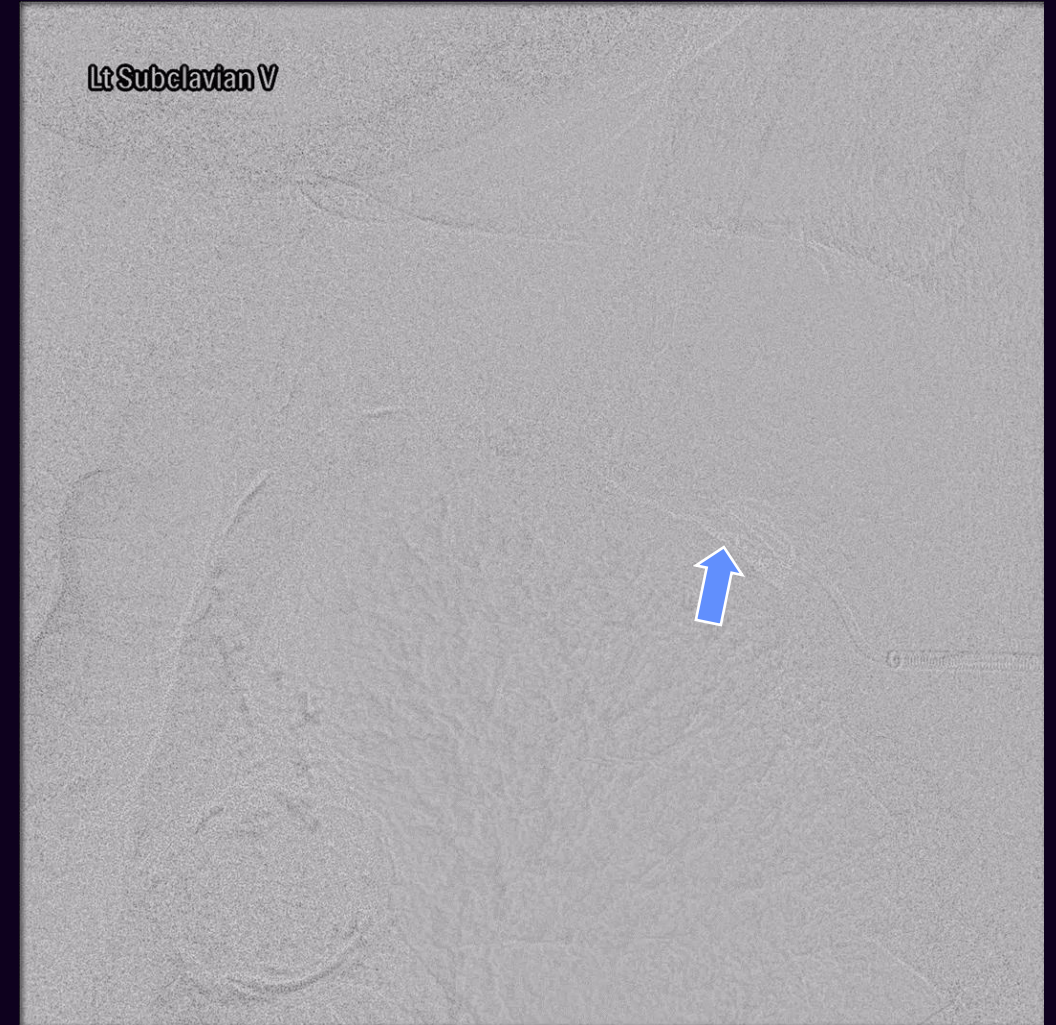
He noticed Lt. arm (shunt arm) swelling for 1 month.

CT demonstrated short segment subclavian vein occlusion (blue arrow).



Preoperative DSA:

A 6Fr. Destination Sheath was inserted from Brachial vein.
Occlusion stump is not clear due to too many collaterals.

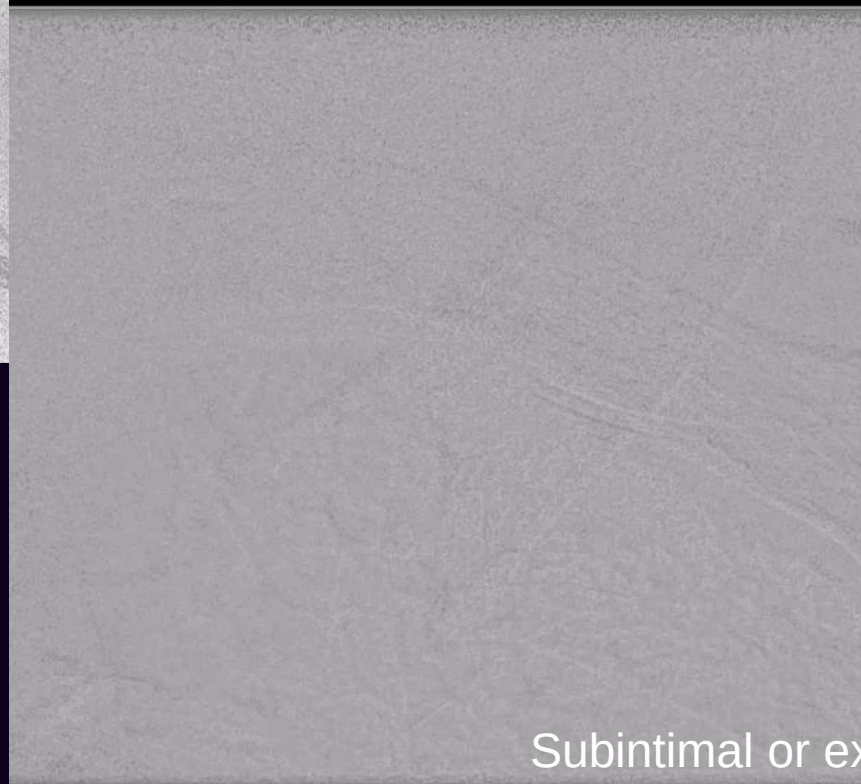


Fluoroscopic guided recanalization:

0.035 inch wire, 0.014 inch wire and microcatheter was attempted,
but failed with subintimal or extra vascular contrast.



0.014 inch wire

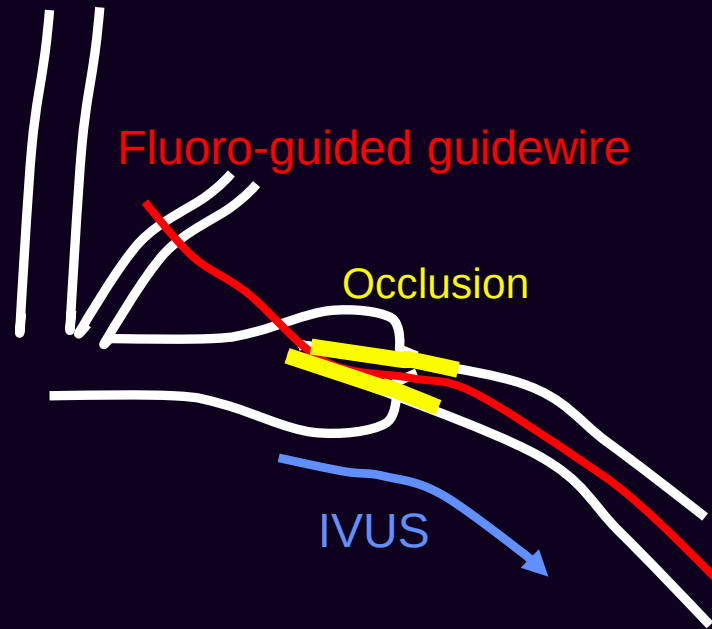


Subintimal or extravascular contrast

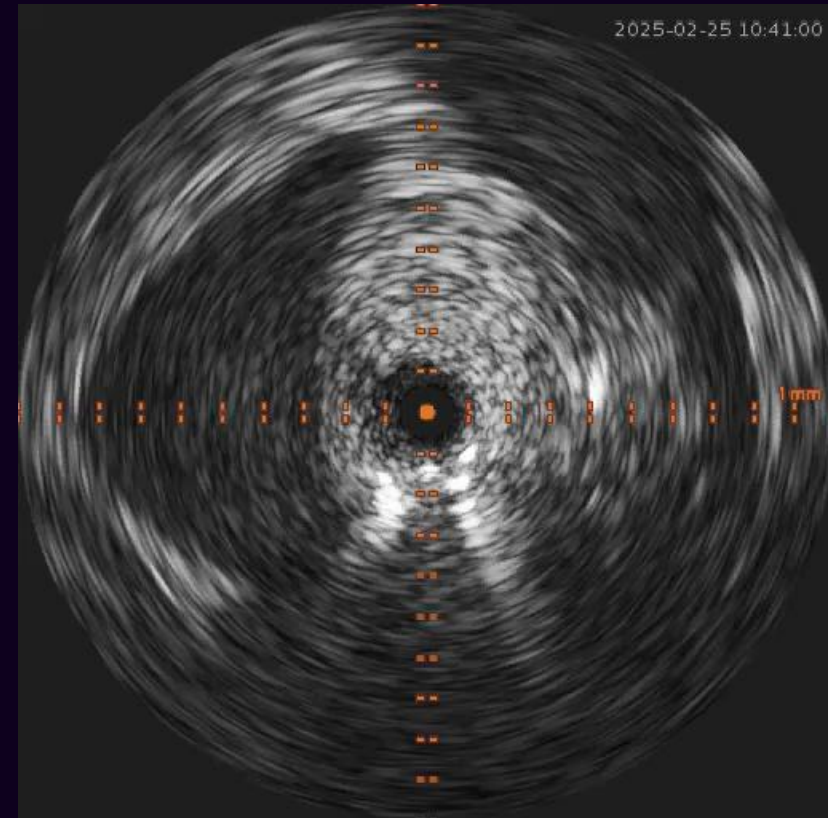
IVUS.

IVUS showed precise anatomy of the occlusion.

The guidewire was penetrated thickened venous valve leaflet at distal edge and penetrated the wall at distal CTO. We could not manipulate the wire to the true lumen on fluoroscopic guidance.



Schema of the anatomy Fluoro-guided wire route.

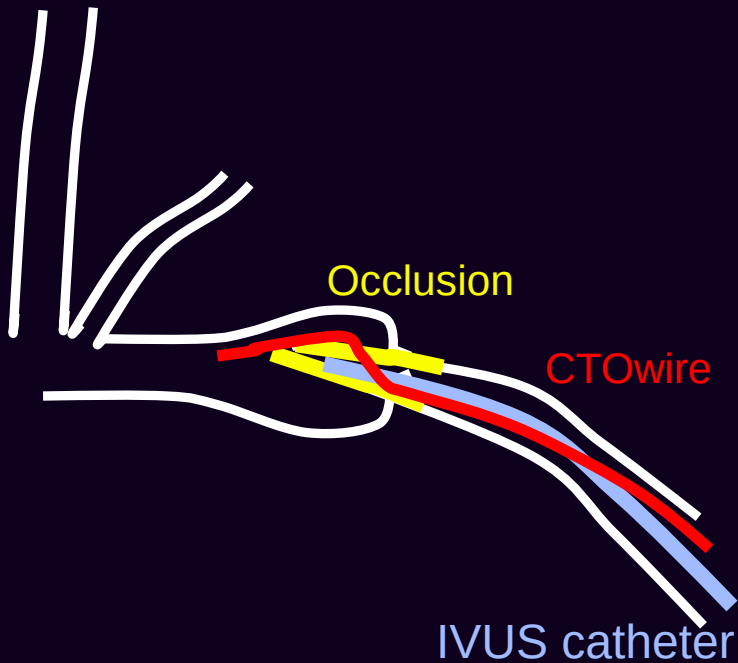


IVUS (Eagle-eye ST)

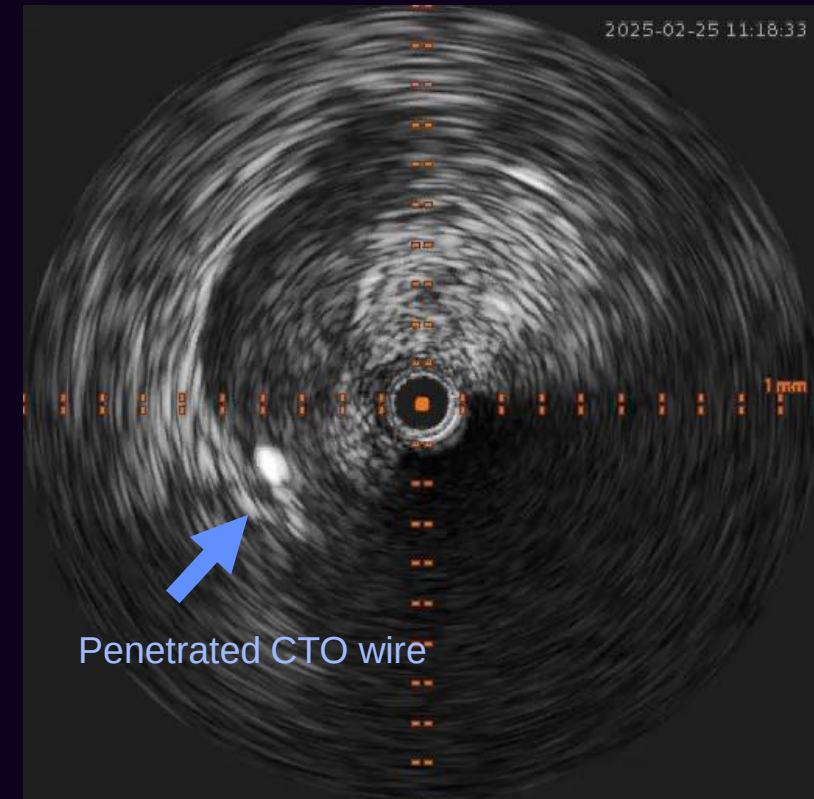
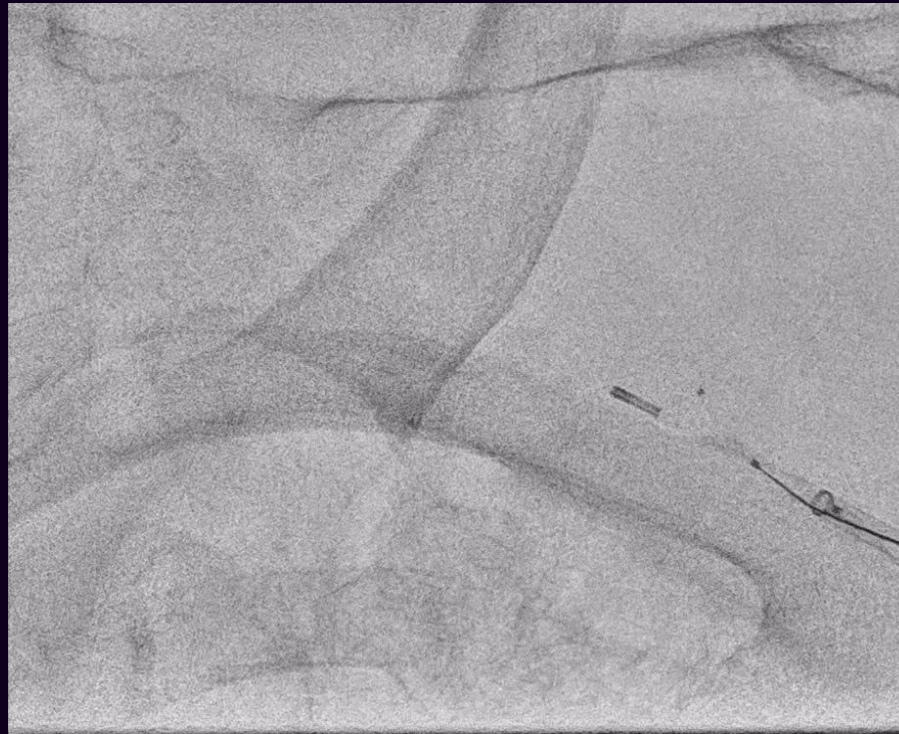
IVUS guided wiring was attempted.

We advanced the wire by Tip detection method.

CTO wire could penetrate CTO and advanced in central true lumen



Schema of IVUS-guided wire route.



IVUS after wire cross.

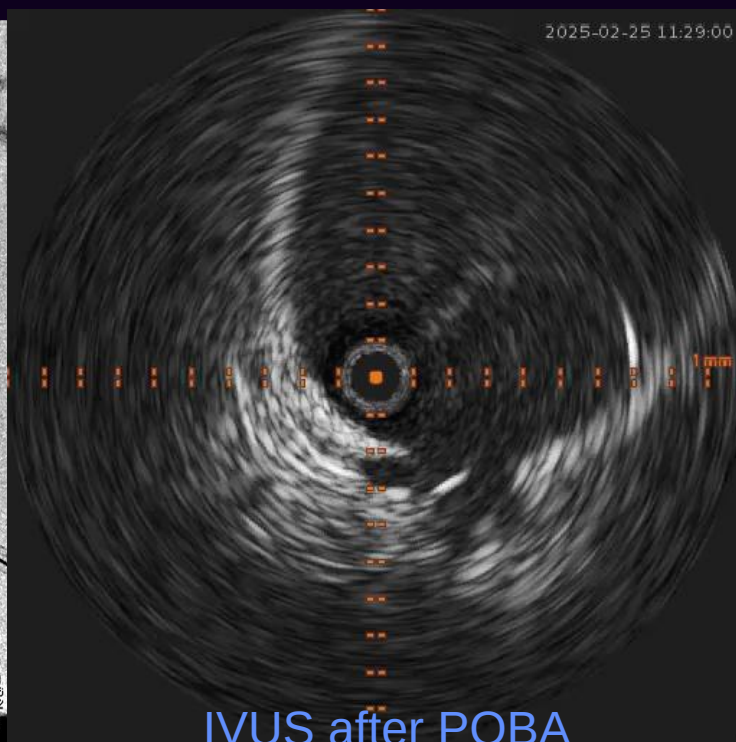
Microcatheter: Sargent 14 (iVascular and Medicos HIRATA)

Guidewire: AstatoXS9-40, Crosslead penetration (ASAHI intecc.) .

IVUS showed the wire crossed true lumen.
POBA by Cutting balloon 5x20, Mustang 8x40 was done.
As Stenosis was remained at CTO, SMART stent 10x60 was attempted.



Guidewire crossed successfully.



Remaining stenosis clearly visualized.



Final angiogram

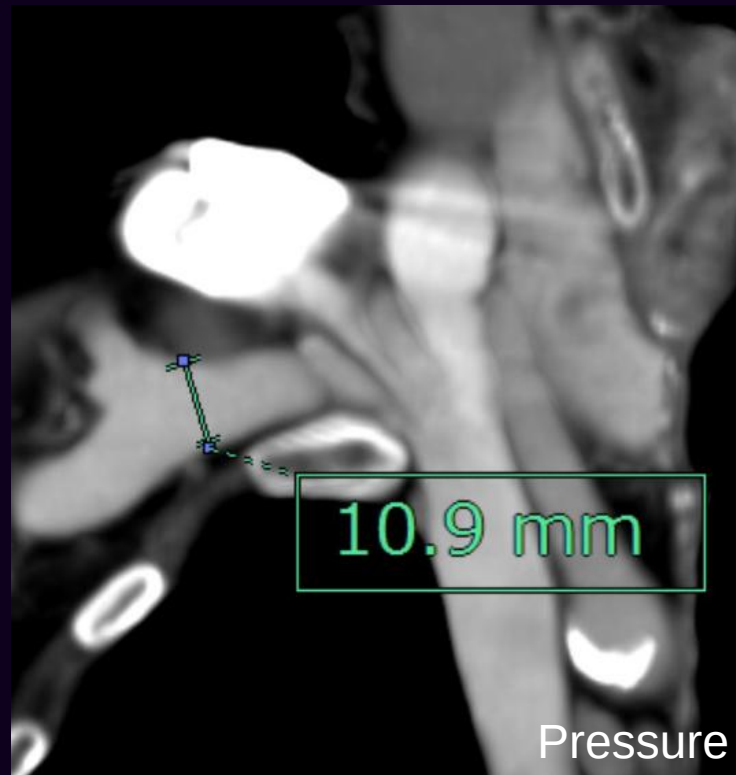
Case2: 87yo male

8 years history of maintenance HD

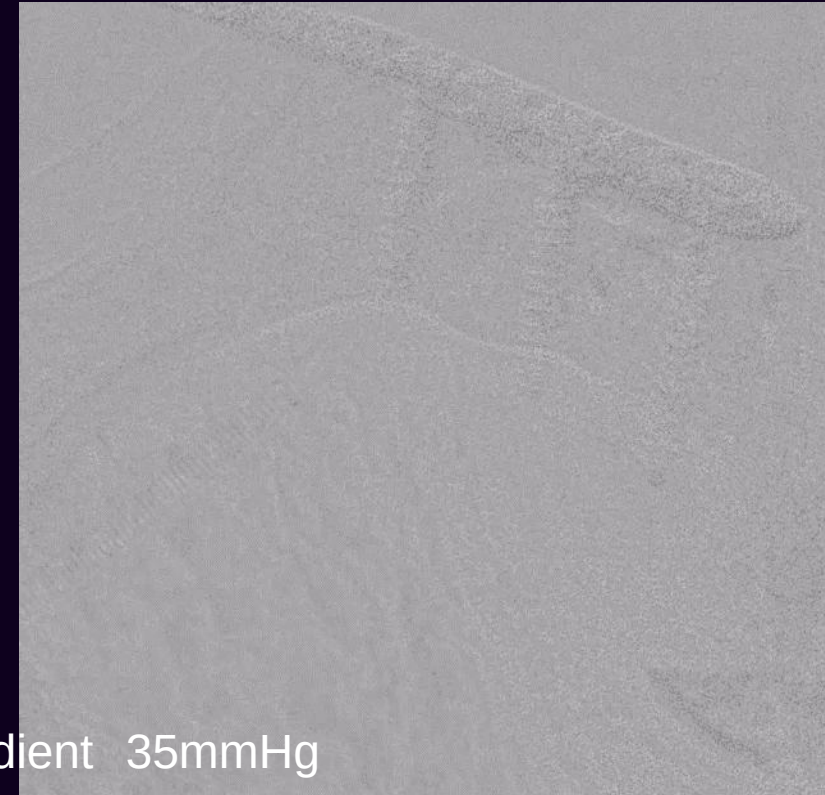
Right arm swelling was observed for 1 month.

Past illness: Arrhythmia (Warfarin)

Acute limb ischemia due to embolization



Pressure gradient 35mmHg



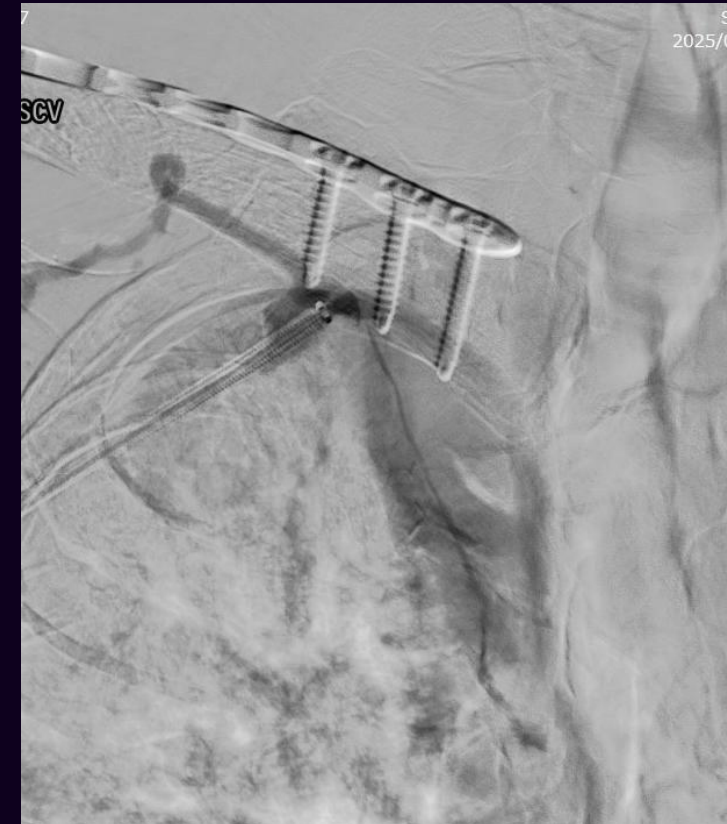
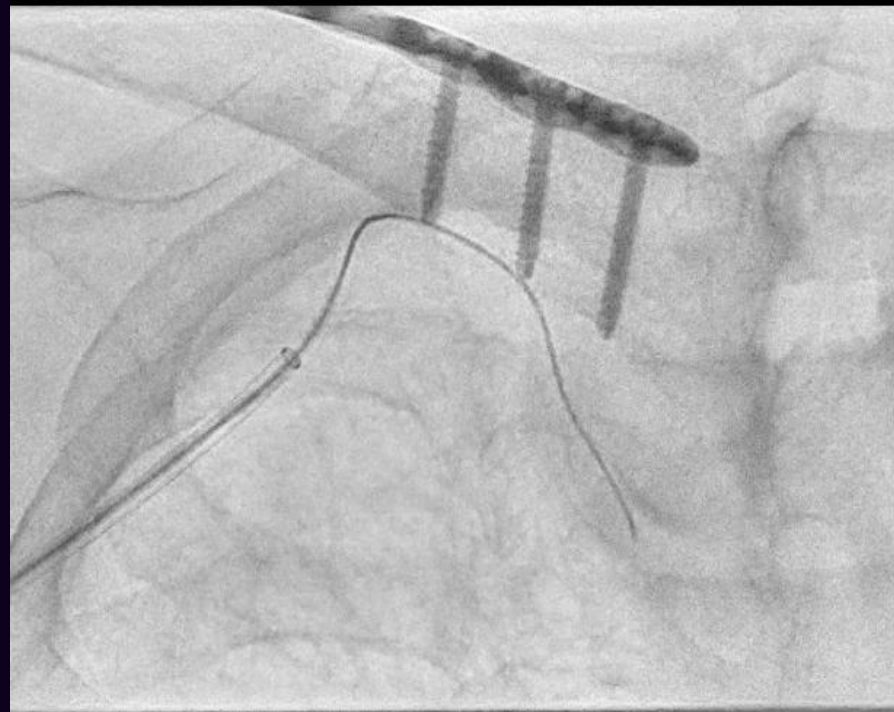
Case2: 87yo male

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A 0.014 wire (3g) goes to subintimal space

Case2: 87yo male

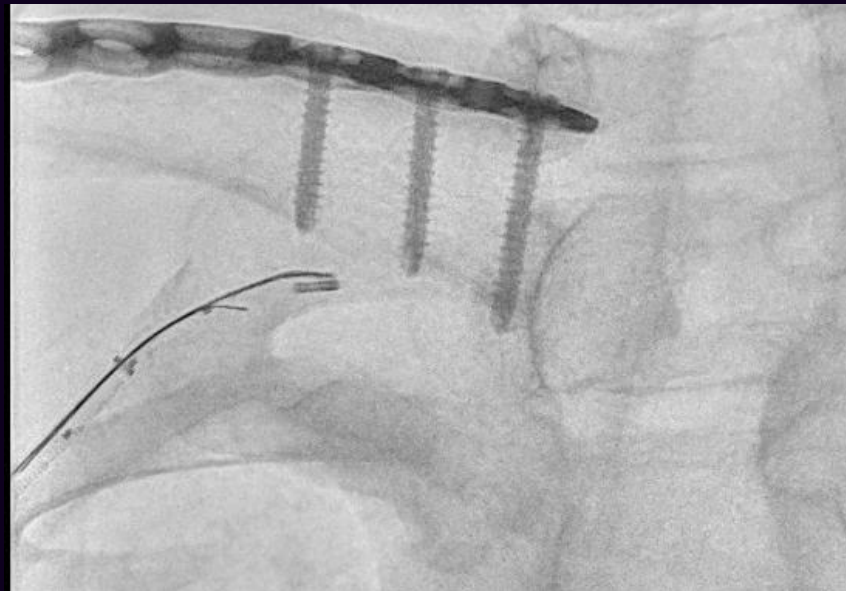
8 years history of maintenance HD

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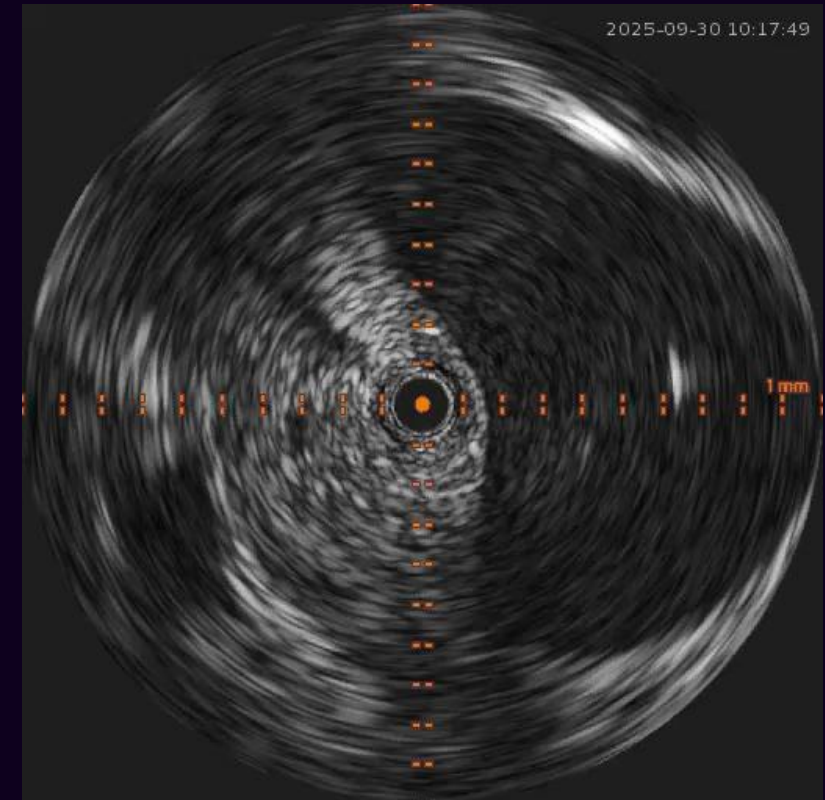
Past illness: Arrhythmia (Warfarin)

Acute limb ischemia due to embolization

IVUSガイド下再開通



Advance a CTO wire under IVUS guidance



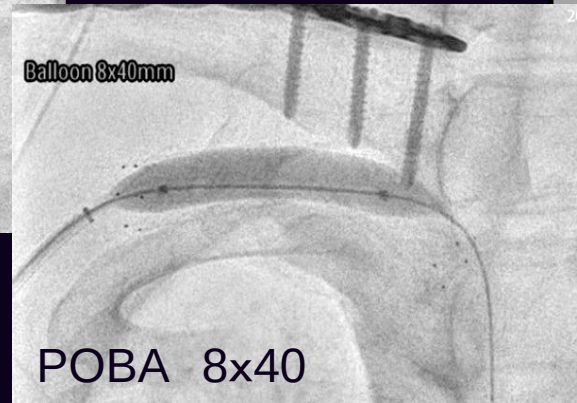
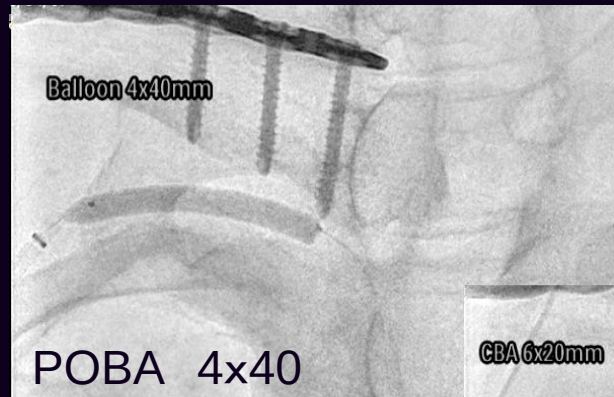
Case2: 87yo male

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Right arm swelling was observed for 1 month.

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Discussion:

EVT is a minimally invasive, safe, and widely accessible alternative. During EVT, certain technical tips ensure a safe recanalization.

Gupta H. et al. CVIR 1998 21(6): 508-511.
Silanathan G. et al. J vasc Access. 2015;16(4):309-314.
Malik AK et al. Cardiovasc interv ther. 2015 16(4): 309-314.

IVUS guided procedure improve the success rate and reduce complication during CVO recanalization, especially using CTO wires. IVUS based 3D wiring enables accurate wire control which improves the success rate of antegrade wiring, reduce the procedure time and avoid additional puncture.

Effect to the longtime patency is still unknow, further case accumulation is necessary.

Tanaka k. et al. J Am Coll Cardiol interv. 2019;12(8) 545-555.
Okamura A. et al. JACC 2020;13(1) 74-82.
Tanaka k. et al. J Am Coll Cardiol interv. 2020;13(8) e69-e70.
Goel PK et al. JACC 2021;14(7) 803-806.

Conclusion:

IVUS guided recanalization with Tip detection method for CVO may be an effective option in hemodialysis patients.

